RAV v1 — Canonical Baseline (per your setup)

Setup Summary
• PSU: 30 kV DC precipitator supply (current-limited, rippley DC)
• Electrodes: Flat metal cathode plate (bottom); anode is 1 mm stainless spring wire (vertical from above)
• Dielectric/workpiece: Red terracotta clay puck, Ø 25 mm × 5 mm
• Hydration: ~10 drops tap water on bottom face, 3–4 drops on top face
• Gap: Sustained RAV at 3–4 mm anode–cathode separation (through/around the clay)
• Environment: Open air, 68–75 °F, 40–60 % RH, no vacuum chamber

1) Formation & Lifecycle
A. Pre■RAV search — violet/blue streamers anchor to moisture hot spots.
B. Vortex organization — rotating glow disc forms above wet patch.
C. RAV lock■in — bright spheroid (~7–10 mm) with ~90–110 kHz rotation.
D. Decay & imprint — glow collapses; clay etched with rings and dendrites.

2) Field Architecture
Axial E■field between anode and clay, circumferential B■field around current path, E×B drift causing rotation.
Layers: core → inner sheath → boundary layer → return path through moist clay.

3) Operating Window
• Voltage: Raise slowly until glow locks; reduce if arcing.
• Gap: 3–4 mm sweet spot; too small = arcs, too large = diffuse.
• Water: Bottom richer than top for stable return path.
• Humidity: 40–60 % ideal.

4) Expected Signatures
• Soft steady hiss + single tone.
• Optical frequency ~90–110 kHz.
• EM harmonics detectable by Photon Harp or Owon XSA810.

5) Clay & Surface Effects
Etched rings and dendrites form PEC/DEC zones; pattern lowers re■ignition voltage.

6) Quick■Start SOP
1. Prepare clay puck, wet as specified.
2. Place on cathode; align anode 3–4 mm above center.
3. Ramp voltage until streamers then glow disc forms.
4. Hold steady for 1 cm RAV sphere.
5. Measure frequency (~100 kHz).
6. Ramp down slowly.

7) Measurement Pointers
• Photon Harp: edge placement for best modulation capture.
• Owon XSA810: near■field probe 1–3 cm from glow; 10–500 kHz sweep.
• Scope loop: shows ~100 kHz waveform during stability.

8) Troubleshooting
• No lock → add drop of water on top or sharpen anode.

• Hard arcing → increase gap or lower voltage.
• Drift → re■center anode or re■wet bottom.
• Dim glow → raise kV slightly or reduce gap.
• Boiling → too wet on top; blot and wait 30 s.

9) Forward■Looking Tweaks
Experiment with anode tip shape, water gradient, and clay doping (e.g., mica or salts) to tune sheath behavior and emissivity.